

**EXPRESS MAIL NO.: EL988725562US**  
**DEPOSITED ON: November 24, 2003**

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

**Application No. : Not Yet Assigned Conf. No.: N/A**  
**Applicant(s) : Daniel E. Resasco, Walter E. Alvarez,**  
**Jose E. Herrera and Leandro Balzano**  
**Filed : Herewith**  
**TC/A.U. : 1754**  
**Examiner : P. Lish**  
**Title : METHOD AND CATALYST FOR PRODUCING**  
**SINGLE WALLED CARBON NANOTUBES**

**Docket No. : 7356.005**  
**Customer No. : 30589**

**MS Patent Application**  
**Commissioner for Patents**  
**P.O. Box 1450**  
**Alexandria, VA 22313-1450**

**INFORMATION DISCLOSURE STATEMENT**

**List of Sections Forming Part of This  
Information Disclosure Statement**

The following sections are being submitted for this Information Disclosure Statement:

1. ☒ Preliminary Statements
2. ☒ Form PTO-1449 (Modified)
3. ☐ Statement as to Information Not Found in Patents or Publications
4. ☒ Identification of Prior Application in Which Listed Information Was Already Cited and for Which No Copies Are Submitted or Need Be Submitted

- 5.    ☒   Copies of Listed Information Items Accompanying this Statement
- 6.    ☒   Identification of Person(s) Making this Information Disclosure Statement

### **Section 1.           Preliminary Statements**

Applicants submit herewith patents, publications or other information of which they are aware, which they believe may be material to the examination of this application and in respect of which there may be a duty to disclose.

The filing of this information disclosure statement shall not be construed as a representation that a search has been made (37 C.F.R. § 1.97(g)), an admission that the information cited is, or is considered to be, material to patentability or that no other material information exists.

The filing of this information disclosure statement shall not be construed as an admission against interest in any manner. Notice of January 9, 1992, 1135 O.G. 13-25, at 25.

### **Section 2.           Form PTO-1449 (Modified)**

☒   A Completed Form PTO-1449 (Modified) is attached hereto.

### **Section 3. Statement as to Information Not Found in Patents or Publications (Information Not Listed in Form PTO-1449 (Modified))**

**Section 4. Identification of Prior Application in Which Listed Information Was Already Cited and for Which No Copies Are Submitted or Need Be Submitted**

This application relies, under 35 U.S.C. § 120, on the earlier filing date of prior application Serial No. 10/118,834, filed on April 8, 2002 (date).

*(complete the following, if applicable)*

- ☒ This application also relies, under 35 U.S.C. 120, on the earlier filing date of prior application Serial No. 09/938,847, filed on November 19, 2001 (date).

**Section 5. Copies of Listed Information Items Accompanying this Statement**

Legible copies of all items listed in Form PTO-1449 (Modified) accompany this information disclosure statement.

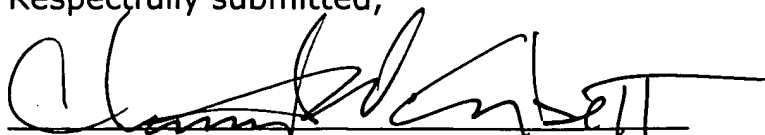
- ☐ Exception(s) to above:
- ☐ Items in prior application from which an earlier filing date is claimed for this application, as identified in Section 4.
- ☐ Cumulative patents or publications identified in Section 5.

**Section 6. Identification of Person(s) Making this INFORMATION DISCLOSURE STATEMENT**

The person making this statement is the attorney who signs below on the basis of the information:

- ☐ supplied by the inventor(s)
- ☐ supplied by an individual associated with the filing and prosecution of this application (37 C.F.R. § 1.56(c)).
- ☒ in the attorney's file

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Christopher W. Corbett', written over a horizontal line.

Christopher W. Corbett, Reg. No. 36,109

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Date Deposited: 11/24/2003

Substitute for form 1449A/PTO

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**

Complete if Known	
Application Number	Not Yet Assigned
Filing Date	Herewith
First Named Inventor	Daniel E. Resasco et al.
Group Art Unit	1754
Examiner Name	P. Lish
Attorney Docket Number	7356.005

(use as many sheets as necessary)

U. S. PATENT DOCUMENTS						
EXAM INIT.	Cite No. 1	<u>U.S. PATENT NUMBER</u> Number	Kind Code <sup>2</sup> (if known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD- YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	AA	3746657		Miller et al.	07/17/1973	
	AB	4456694		Blaskie et al.	06/26/1984	
	AC	4574120		Thompson	03/04/1996	
	AD	4663230		Tennent	05/05/1987	
	AE	5165909		Tennent et al.	11/24/1992	
	AF	5227038		Smalley et al.	07/13/1993	
	AG	5300203		Smalley	04/05/1994	
	AH	5405996		Suzuki et al.	04/11/1995	
	AI	5482601		Ohshima et al.	01/09/1996	
	AJ	5543378		Wang	08/06/1996	
	AK	5556517		Smalley	09/17/1996	
	AL	5560898		Uchida et al.	10/01/1996	
	AM	5578543		Tennent et al.	11/26/1996	
	AN	5587141		Ohshima et al.	12/24/1996	
	AO	5591312		Smalley	01/07/1997	
	BA	5603907		Grochowski	02/18/1997	

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EXAM INIT.	Cite No. 1	U.S. PATENT NUMBER Number	Kind Code <sup>2</sup> (if known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD- YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	BB	5648056		Tanaka	07/15/1997	
	BC	5641466		Ebbesen et al.	06/24/1997	
	BD	5695734		Ikazaki et al.	12/09/1997	
	BE	5698175		Hiura et al.	12/16/1997	
	BF	5707916		Snyder et al.	01/13/1998	
	BG	5744235		Creehan	04/28/1998	
	BH	5753088		Olk	05/19/1998	
	BI	5773834		Yamamoto et al.	06/30/1998	
	BJ	5780101		Nolan et al.	07/14/1998	
	BK	5814290		Niu et al.	09/29/1998	
	BL	5877110		Snyder et al.	03/02/1999	
	BM	5965267		Nolan et al.	10/12/1999	
	BN	5985232		Howard et al.	11/16/1999	
	BO	5997832		Lieber et al.	12/07/1999	
	BP	6333016		Resasco et al.	12/25/2001	
	BQ	6413487		Resasco et al.	07/02/2002	

## FOREIGN PATENT DOCUMENTS

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		Office 3 known)	Number 4	Kind Code <sup>5</sup> (if			
	CA		PCT/US00/15362		International Search Report	10/17/2000	

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		Office 3 known)	Number 4	Kind Code <sup>5</sup> (if				
	CB		PCT/US02/23155		International Search Report	07/21/2003		
	CC		WO 97/09272		PCT/US	03/13/1997		
	CD		WO 98/39250		PCT/US	09/11/1998		
	CE		WO 00/73205		PCT/US	12/07/2000		
	CF		WO 98/42620		PCT/JP	10/01/1998		A
	CG		WO 00/17102		PCT International Publication	03/30/2000		
	CH		406122489		Japan	05/1994		X

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## NON PATENT DOCUMENTS

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	DA	ALVAREZ, ET AL., "Synergism of Co and Mo in the catalytic production of single-wall carbon nanotubes by decomposition of CO", <i>Elsevier Science Ltd.</i> , Carbon 39 (2001), pp. 547-558.
	DB	ANDERSON et al., "50 nm Polystyrene Particles via Miniemulsion Polymerization", <i>Macromolecules</i> , American Chemical Society, vol. 35, pp. 574-576, 2002.
	DC	BANDOW ET AL., "Effect of the Growth Temperature on the Diameter Distribution and Chirality of Single-Wall Carbon Nanotubes", <i>The American Physical Society</i> , Physical Review Letters, Vol. 80, No. 17, (1998), pp. 3779-3782.
	DD	BETHUNE et al. "Cobalt-Catalysed Growth of Carbon Nanotubes with Single-Atomic-Layer Walls", <i>Letters to Nature</i> , vol. 363, pp. 605-607, 06/17/1993.

EXAM INIT.		<p style="text-align: center;"><b>NON PATENT DOCUMENTS</b></p> <p>Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published</p>
	DE	BOWER et al., "Deformation of Carbon Nanotubes in Nanotube-Polymer Composites", Applied Physics Letters, vol. 74, no. 22, pp. 3317-3319, 05/31/1999.
	DF	V. Brotons et al., "Catalytic influence of bimetallic phases for the synthesis of single-walled carbon nanotubes", Journal of Molecular Catalysis, A: Chemical, vol. 116, pp. 397-403, 12/16/1997.
	DG	CADEK et al., "Mechanical and Thermal Properties of CNT and CNF Reinforced Polymer Composites", Structural and Electronic Properties of Molecular Nanostructures, American Institute of Physics, pp. 562-565, 2002.
	DH	CASSELL et al., "Large Scale CVD Synthesis of Single-Walled Carbon Nanotubes", J. Phys. Chem. B., American Chemical Society, vol. 103, pp. 6484-6492, 1999.
	DI	CHATURVEDI ET AL., "Properties of pure and sulfided NiMoO <sub>4</sub> and CoMoO <sub>4</sub> catalysts: TPR, XANES and time-resolved XRD studies", Database Accession No. EIX99044490981 XP002246342, Proceedings of the 1997 Mrs Fall Symposium, Boston, MA, USA, December 2-4, 1997; Mater Res Soc Symp Proc, Materials Research Society Symposium-Proceedings, Recent Advances in Catalytic Materials, 1998, Mrs. Warrendale, PA, USA.
	DJ	CHE et al., "Chemical Vapor Deposition Based Synthesis of Carbon Nanotubes and Nanofibers Using a Template Method", Chemical Mater., vol. 10, pp. 260-267, 1998.
	DK	CHEN et al., "Dissolution of Full-Length Single-Walled Carbon Nanotubes", J. Phys. Chem. B, vol. 105, pp. 2525-2528, 2001.
	DL	CHEN et al., "Growth of carbon nanotubes by catalytic decomposition of CH <sub>4</sub> or CO on a Ni-MgO catalyst", Carbon vol. 35, No. 10-11, pp. 1495-1501, 1997.
	DM	CHENG et al., "Bulk Morphology and Diameter Distribution of Single-Walled Carbon Nanotubes Synthesized by Catalytic Decomposition of Hydrocarbons", Chemical Physics Letters, vol. 289, pp. 602-610, 06/19/1998.
	EA	CHENG et al., "Large-Scale and Low-Cost Synthesis of Single-Walled Carbon Nanotubes by the Catalytic Pyrolysis of Hydrocarbons", Applied Physics Letters, vol. 72, no. 25, pp. 3282-3284, 06/22/98.



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	EB	DAI et al., "Single-Wall Nanotubes Produced By Metal-Catalyzed Disproportionation of Carbon Monoxide", Chemical Physics Letters, vol. 260, pp. 471-475, 09/27/1996.
	EC	Database, Accession No. 1999-366878, Cano, "Canon KK", XP-002149235, 05/25/1999.
	ED	DE BOER ET AL., "The cobalt-molybdenum interaction in CoMo/SiO <sub>2</sub> catalysts: A CO-oxidation study", <i>Elsevier Science Ltd.</i> , Solid State Ionics 63-65 (1993), pp. 736-742.
	EE	DENG et al., "Hybrid Composite of Polyaniline Containing Carbon Nanotube", Chinese Chemical Letters, vol. 12, pp. 1037-1040, 2001.
	EF	FONSECA et al., "Synthesis of single-and multi-wall carbon nanotubes over supported catalysts", Applied Physics A, vol. 67, pp. 11-22, 1998.
	EG	FRANCO et al., "Electric and magnetic properties of polymer electrolyte/carbon black composites", Solid State Ionics 113-115, pp. 149-160, 1998.
	EH	GASPAR et al., "The influence of Cr precursors in the ethylene polymerization on Cr/SiO <sub>2</sub> catalysts", Applied Catalysis A: General, vol. 227, pp. 240-254, 2002.
	EI	GONG et al., "Surfactant-Assisted Processing of Carbon Nanotube/Polymer Composites", Chemical Material, vol. 12, pp. 1049-1052, 2000.
	EJ	GOVINDARAJ et al., "Carbon structures obtained by the disproportionation of carbon monoxide over nickel catalysts", Materials Research Bulletin, vol. 33, no. 4, pp. 663-667, 1998.
	EK	HAFNER et al., "Catalytic growth of single-wall carbon nanotubes from metal particles", Chemical Physics Letters, vol. 296, pp. 195-202, 1998.
	EL	HAMON et al., "End-group and defect analysis of soluble single-walled carbon nanotubes", Chemical Physics Letters, vol. 347 pp. 8-12, 2001.
	FA	HERNADI et al., "Catalytic synthesis of carbon nanotubes using zeolite support", Elsevier Science Inc. 1996.
	FB	HWANG et al., "Carbon nanotube reinforced ceramics", Journal of Materials Chemistry, vol. 11, pp. 1722-1725, 2001.

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	FC	HYPERION CATALYSIS INTERNATIONAL Website; <a href="http://www.fibrils.com/esd.htm">http://www.fibrils.com/esd.htm</a> ;"Unique Slough Resistant SR™ Series ESD Thermoplastic Product Line Offers Reduced Particle Contamination For Demanding Electronic Applications," and Hyperion Homepage <a href="http://www.fibrils.com">http://www.fibrils.com</a> .
	FD	IIJIMA, "Helical Microtubules of Graphitic Carbon", Letters to Nature, vol. 354, pp. 56-58, 11/07/1991.
	FE	IIJIMA et al., "Single-Shell Carbon Nanotubes of 1-nm Diameter", Letters to Nature, vol. 363, pp. 603-605, 06/17/1993.
	FF	IVANOV et al., "The Study of Carbon Nanotubes Produced by Catalytic Method", Chemical Physics Letters, vol. 223, pp. 329-335, 1994.
	FG	JIN et al., "Alignment of Carbon nanotubes in a polymer matrix by mechanical stretching", Applied Physics Letters, vol. 73, no. 9, pp. 1197-1199, 08/31/1998.
	FH	JOURNET et al., "Large-Scale Production of Single-Walled Carbon Nanotubes by the Electric-Arc Technique", Letters to Nature, vol. 338, pp. 756-758, 08/21/1997.
	FI	KITIYANAN et al., "Controlled production of single-wall carbon nanotubes by catalytic decomposition of CO on bimetallic Co-Mo catalysts", Chemical Physics Letters, vol. 317 , pp. 497-503, 2/4/2000.
	FJ	KRISHNANKUTTY et al., "The Effect of Copper on the Structural Characteristics of Carbon Filaments Produced from Iron Catalyzed Decomposition of Ethylene," Catalysts Today, vol. 37, pp. 295-307, 1997.
	FK	LANDFESTER et al., "Miniemulsion polymerization", 6/4/2003, <a href="http://www.mpikg-golm.mpg.de/kc/landfester/">http://www.mpikg-golm.mpg.de/kc/landfester/</a> , 1-22
	FL	LANDFESTER, "Polyreactions in Miniemulsions", Macromol. Rapid Commun., vol. 22, no. 12, pp. 896-936, 2001.
	GA	LANDFESTER, "The Generation of Nanoparticles in Miniemulsions", Advanced Materials, vol. 13, no. 10, pp. 765-768, 05/17/2001.
	GB	LI et al., "Large-Scale Synthesis of Aligned Carbon Nanotubes", Science, vol. 274, pp. 1701-1703, 12/06/1996.

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	GC	McCARTHY et al., "A Microscopic and Spectroscopic Study of Interactions between Carbon Nanotubes and a Conjugated Polymer", J. Phys. Chem. B, vol. 106, pp. 2210-2216, 2001.
	GD	NIYOGI et al., Communications to the Editor, "Chromatographic Purification of Soluble Single-walled Carbon Nanotubes (s-SWNTs)", J. Am. Chem. Soc., vol. 123, pp. 733-734, 2001.
	GE	POMPEO et al., "Water Solubilization of Single-Walled Carbon Nanotubes by Functionalization with Glucosamine", Nano Letters, American Chemical Society, vol. 2, no. 4, pp. 369-373, 2002.
	GF	QIAN et al., "Load transfer and deformation mechanisms in carbon nanotube-polystyrene composites", Applied Physics Letters, American Institute of Physics, vol. 76, no. 20, pp. 2868-2870, 05/15/2000.
	GG	RAZAVI, "Metallocene catalysts technology and environment", Chemistry 3, pp. 615-625, 2000.
	GH	RINZLER et al., "Large-Scale Purification of Single-Wall Carbon Nanotubes: Process, Product, and Characterization," Applied Physics A, vol. 67, pp. 29-37, 1998.
	GI	SEARS et al., "Raman scattering from polymerizing styrene. I. Vibrational mode analysis <sup>a)</sup> ", J. Chem. Phys., vol. 75, no. 4, pp. 1589-1598.
	GJ	SHAFFER et al., "Fabrication and Characterization of Carbon Nanotube/Poly (vinyl alcohol) Composites**", Advanced Materials, vol. II, No. 11, pp. 937-941, 1999.
	GK	THESS et al., "Crystalline Ropes of Metallic Carbon Nanotubes", Science, vol. 273, pp. 483-487, 07/26/1996.
	GL	TIARKS et al., "Encapsulation of Carbon Black by Miniemulsion Polymerization", Macromol. Chem. Phys., vol. 202, pp. 51-60, 2001.
	HA	TIARKS et al., "Silica Nanoparticles as Surfactants and Fillers for Latexes Made by Miniemulsion Polymerization", Langmuir, American Chemical Society, vol. 17, pp. 5775-5780, 2001.

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	HB	WILLEMS et al., "Control of the outer diameter of thin carbon nanotubes synthesized by catalytic decomposition of hydrocarbons", Chemical physics Letters, vol. 317, pp. 71-76, 01/28/2000.
	HC	Yakobson et al.; "Fullerene Nanotubes: C <sub>1,000,000</sub> and Beyond," American Scientist, vol. 85, pp. 324-337, Jul-Aug 1997.
	HD	ZHAO, et al., "Chromatographic Purification and Properties of Soluble Single-Walled Carbon Nanotubes", American Chemical Society, Page Est: 4.1, pp. A-E, 02/22/2001.
	HE	ZHU et al., "Direct Synthesis of Long Single-Walled Carbon Nanotube Strands", Science, vol. 296, pp. 884-886, 05/13/2002.
	HF	US 20020165091 A1, Resasco et al., Publication Date 11/07/2002.
	HG	US 20020127169 A1, Smalley et al., Publication Date 09/12/2002.
	HH	US 20010031900 A1, Margrave et al., Publication Date 10/18/2001.
<b>Non Patent Documents:</b> <sup>1</sup> Unique citation designation number. <sup>2</sup> Applicant is to place a check mark here if English language Translation is attached.		
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